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A SURVEY ON SMALL MAMMALS AND THEIR PARASITES IN BATAM ISLAND, RIAU, INDONESIA*

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ABSTRACT

Survai terhadap vektor dan hewan reservoir penyakit telah dilakukan di Pulau Batam pada tanggal 11 – 26 Januari 1981. Selama survai tersebut dapat ditangkap sejumlah 54 ekor hewan yang terdiri dari Rattus exulans, R. Rattus, R.r. diardii dan R. surifer. Salah satu jenis vektor penyakit scrub typhus, Leptotrombidium (L) arenicola ditemukan pada tikus yang ditangkap di daerah Tanjung Riau. Xenopsylla cheopis, vektor penyakit pes, ditemukan di daerah survai yang bercorak kota. Endoparasit yang ditemukan pada hewan tangkapan terdiri dari 6 genera cacing yang dikenal dapat menularkan penyakit pada manusia. Dua dari 50 sera hewan yang diperiksa secara serologis terdapat positif untuk murine typhus.

INTRODUCTION

Batam Island, located approximately 10 km away from Singapore, will be developed into a bonded island. As a well-developed industrial area, this island will attract people from other islands and urbanization will occur. The population of this island is expected to increase from approximately 17,000 to 800,000 and the impact of urbanization and industrialization on public health should be considered. In order to obtain information on the health status of the island a biomedical survey was conducted. This paper will report on the existence of small mammals and their parasites collected during the survey, in relation to the distribution of zoonotic diseases in the animal population.

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MATERIALS AND METHOD

Study area:

Four locations were selected which included 3 kinds of habitats (house, shrub & forest).

1. *Sungai Harapan* (1°07'N, 103°55'E), a residential area surrounded by short shrubs and grass.
2. *Tanjung Riau* (1°07'N, 103°55'E), a small village in the coastal area surrounded by mangrove and primary forest.
3. *Batu Ampar* (1°10'N, 104°00'E), the biggest town on the island near the sea surrounded by mangrove and rubber plantations.
4. *Duri Angkang* (1°04'N, 104°03'E), a small village located in the inlet of the sea surrounded by rubber plantations and gardens.

Trappings:

In each habitat 40 traps were set using baked coconut as baits. The total number of traps use during the survey amounted to 400. Animals collected were brought back to the field laboratory to be processed. Each animal was put in a cloth bag, anasthetized and bled. Blood samples were sent to U.S. NAMRU-2 laboratory in Jakarta for serological examination of scrub and murine typhus. Animals were combed to

collect the ectoparasites, chiggers were removed carefully from the animal's ears. Ectoparasites were then processed for identification. The carcasses were dissected and the heart, liver, spleen and lungs were examined for endoparasites. Some animal skins were kept for identification and reference.

RESULTS

A total of 54 animals were captured consisting of 4 species of *Rattus: Rattus exulans* (53.7 %), *Rattus rattus* (3.7 %), *Rattus rattus diardii* (38.9 %) and *Rattus surifer* (3.7 %). The trap success was highest in Batu Ampar (28.75 %) followed by Sungai Harapan (20 %), Tanjung Riau (10.83 %) and Duri Angkang (12.5 %) (Table 1). The trap success in the forest was the lowest (3.3 %).

Five groups of ectoparasites were found consisting of 4 species of chiggers, 6 species of mites, 1 tick species, 1 flea species and 2 species of lice (Table 2).

Tabel 1 **Small mammals collected in 17 – 22 January 1981 in Batam Island**

Animal species	Number of animals collected							Total
	Duri Angkang		Batu Ampar		Tanjung Riau		Sungai Harapan	
	Houses	Shrubs	Houses	Shrubs	Houses	Forest	Houses	
	80 *	80	60	20	60	60	40	400
Rattus exulans	3 (3.75) **	–	8 (13.33)	3 (15)	10 (16.66)	–	5 (12.5)	29 (7.25)
Rattus rattus	–	–	1 (1.66)	1 (5)	–	–	–	2 (0.5)
Rattus r. diardii	7 (3.75)	–	7 (11.66)	3 (15)	1 (1.66)	–	3 (7.5)	21 (5.25)
Rattus surifer	–	–	–	–	–	2 (3.3)		2 (0.5)
Total	10 (12.5)	– –	16 (26.65)	7	11 (18.32)	2 (3.3)	8 (20)	54 (13.5)
Average			(28.75)		(10.83)			

* Number of traps
** Trap success

Tabel 2 Ectoparasite infestations on animal hosts captured

Ectoparasite species	Number of host infested			
	R. rattus (2) *	*R.r. diardii* (21)	*R. exulans* (29)	*R. surifer* (2)
Chiggers :				
Ascoschoengastia indica	–	3[a,d]	3[a,d]	–
Eutrombicula wichmanni	–	1[d]	–	–
Gahrliepia (W) lewthwaitei	–	–	2[b,c]	2[c]
Leptotrombidium (L) arenicola	–	–	1[c]	–
Mites :				
Liponyssoides sp.	–	3[b,d]	2[c,d]	–
Laelaps sp.	1[a]	1[a]	–	–
Laelaps aingworthae	–	–	–	2[c]
Laelaps echidninus	1[a]	7[a,b,d]	3[a,b,d]	–
Laelaps nuttalli	–	5[a,b,d]	8[a,b,c,d]	–
Longolaelaps whartoni	–	–	–	2[c]
Ticks :				
Ambylomma sp.	–	1[a]	–	1[c]
Fleas :				
Xenopsylla cheopis	–	4[a,b,d]	4[a,b,c]	–
Lice :				
Hoplopleura pacifica	–	1[a]	3[a,c]	–
Polyplax spinulosa	–	1[a]	1[c]	–

*** Number of animals captured**

a. Batu Ampar ; b. Sungai Harapan; c. Tanjung Riau; d. Duri Angkang

A total of 9 species of worms were collected (Table 3). Those were including 2 lung worms, *Angiostrongylus cantonensis* and *A malaysiensis.*

The serological test yeilded 2 positive cases of murine typhus.

Table 3 Endoparasite infections in the animal hosts captured

Endoparasite species	Number of animals infected			
	R. rattus (2) *	*R.r. diardii* (21)	*R. exulans* (29)	*R. surifer* (2)
Nematoda :				
Angiostrongylus cantonensis	–	–	2[a,c]	–
A. malaysiensis	1[a]	3[a]	3[a,c]	–
Capillaria sp.	–	1[b]	2[c]	–
Gongylonema neoplasticum	2[a]	3[a,d]	3[a,c]	–
Subulura sp.	–[a]	–	–	2[c]
Cestoda :				
Hymenolepis sp.	–	1[a]	–	–
Raillietina sp.	–	1[a]	–	–
Taenia taeniaformis	1[a]	11[a,b,d]	3[a,c]	–
Acanthocephala :				
Moniliformis moniliformis	–	–	1[a]	–

*** Number of animals captured**

a. Batu Ampar; b. Sungai Harapan; c. Tanjung Riau; d. Duri Angkang

DISCUSSION

The two domestic rodent species found, *R. exulans* and *R.r.diardii*, were predominant in all of the areas surveyed (Table 1). The trap success of *R. surifer*, a forest rat, was the lowest (3.3 %). Surveys in two transmigration schemes in South Sumatra revealed the same trap success, i.e. commensal rats (*R.exulans* and *R.r.diardii*) with respectively a trap success of 21.8 % and 39.6 % and field rodents (*R. argentiventer, R.exulans, R.surifer* and *R.tiomanicus*) of 17.4 % and 12.4 % (Lim et al 1978). The trap success of commensal rodents are influenced by the degree of sanitation and density of the human population in the area surveyed. In general, as the human population increases in a village, the number of rats collected will also increase. This is due to the fact that more wasted food is available, which was also apparent in this survey. The highest trap success was found in Batu Ampar, the most crowded residential area (28.75 %). The housing pattern in the trapping-area in Sungai Harapan was similar to that in Batu Ampar and the trap success was 20 %.

One of the 4 chigger species collected, *Leptotrombidium (L) arenicola,* is known to be a scrub typhus vector in Malaysia (Traub, 1960). The favorable habitat of this particular species is sandy soils and consequently this species was only found in Tanjung Riau, a village located on the beach. Other investigators (Traub, 1960;

Upham et al, 1971) reported the existence of this species from West Malaysia; with regard to Indonesia it was also reported from Jakarta (Hadi et al, 1979). *Ascoschoengastia indica* the common species found in shruby area near human habitation, was collected from Batu Ampar and Duri Angkang. This species was reported as a vector of murine typhus in Jakarta (Gispen, 1950), however, no further confirmed information has been reported. Two of the mite species found, *Laelaps aingworthae* and *Longolaelaps whartoni,* were the common species found in the forest rats. In this survey, those two mite species were collected from *R.surifer. Laelaps echidninus* and *Laelaps nuttalli* were predominant. No medical importance of these mites have been reported. The only flea species found, *Xenopsylla cheopis,* is known to be a vector of plague and murine typhus and an intermediate host *Hymenolepis* (Faust et al 1970). It was collected from *R.exulans* and *R.r.diardii* captured in all of the areas surveyed. The flea indices on those two rat species were 0.3 and 0.1 respectively. Especially realizing the fact that probabilities of a plague outbreak will increase with a rising flea index, care should be taken to monitor the flea indices regularly during the development of this island, when the human population starts to increase and more human dwellings become available for rats. However, in this study no serological tests were performed for plague due to the technical problems. Two common species of lice, *Hoplopleura pacifica* and *Polyplax spinulosa* were collected from *R.exulans* and *R.r.diardii* from 2 areas surveyed.

Of the 9 species of helminths collected, *Taenia taeniaformis* was most predominant. It was found in all species of the house rats collected in all of the areas surveyed (Table 3). Some studies performed earlier reported, that the house rat *R.r.diardii,* collected in W.Java, was highly infected with *T.taeniaformis* (Wiroreno, 1975; Holz & Liem, 1965). A human case has been recorded in Argentina (Faust et al., 1971). *Gongylonema neoplasticum,* a nematode worm, found infecting the house rat, was collected in 3 areas surveyed. In Malaysia it was reported, that this species was more common in house rats than feral rats (Singh & Cheong, 1971). This species has produced malignancies in man (Faust et al., 1970). *Angiostrongylus malaysiensis* was found in 3 species of rats in 2 areas surveyed along with *A.cantonensis.* Previous records reported that *A.cantonensis* was more predominant in the field rats (Singh & Cheong, 1971). The presence of *A.cantonensis* should not be ignored, since this nematode has been recovered from human cases and is the cause of human eosinophilic meningoencephalitis which has been reported from Sumatra (Smit, 1962). *Cappillaria* sp. was found in *R.exulans* and *R.r.diardii* collected in Sungai Harapan and Tanjung Riau. *Hymenolepis* sp. and *Raillietina* sp. were found in *R.r.diardii* collected in Batu Ampar. Cases of *Capillaria, Hymenolepis* and *Raillietina* infections have been reported in man elsewhere (Beaver, 1958; Faust et al; 1970). *Moniliformis moniliformis* was collected from *R.exulans* captured in Batu Ampar. Infection of this worm species in human has been reported from Italy, Sudan, Java, Israel and USA (Faust et al; 1970).

Two out of 50 rodent sera were positive for murine typhus. No scrub typhus cases were encountered in the rat population.

CONCLUSION

The present survey indicates that:

1. *L. (L)* arenicola, a potential vector of scrub typhus in Malaysia, was found in Tanjung Riau.
2. *X. cheopis,* a potential vector of plague, was found in urban areas surveyed.
3. Among the endoparasites found in rats at least 6 genera are capable of infecting man e.g. *Angiostrongylus, Capillaria, Hymenolepis, Raillietina, Moniliformis* and *Gongylonema.*

In developing the island, rat control should be highly recommended, since the increase in the rat population would also increase its parasites, thus increasing the *probability* of diseases mentioned above to infect man.

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